

[6450-01- P]

**DEPARTMENT OF ENERGY**

**10 CFR Part 430**

**[Docket Number EERE-2011-BT-NOA-0067]**

**RIN: 1904-AC52**

**Energy Conservation Program: Test Procedure and Energy Conservation Standard for Set-top Boxes and Network Equipment**

**AGENCY:** Office of Energy Efficiency and Renewable Energy, Department of Energy.

**ACTION:** Request for information (RFI) and request for comments; notice of public meeting.

**SUMMARY:** The U.S. Department of Energy (DOE) is initiating a rulemaking and data collection process to develop a potential test procedure and energy conservation standard for set-top boxes (STB) and network equipment. To facilitate this process, DOE has gathered data, identifying several issues associated with currently available industry test procedures, efficiency standards and energy use data for STBs on which DOE is particularly interested in receiving comment. DOE welcomes written comments from the public on any subject within the scope of this rulemaking (including topics not raised in this RFI). DOE will hold a public meeting as part of this RFI.

**DATES:** DOE will hold a public meeting on January 26, 2012 from 9 a.m. to 4 p.m. in Washington, DC. The meeting will also be broadcast as a webinar. See section III, “Public

Participation,” for webinar information, participation instructions, and information about the capabilities available to webinar participants.

DOE will accept comments, data, and information regarding the RFI before and after the public meeting, but no later than **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. For details, see section III, “Public Participation,” of this RFI.

**ADDRESSES:** The public meeting will be held at the U.S. Department of Energy Forrestal Building, Room 8E-089, 1000 Independence Avenue, SW., Washington DC 20585. Please note that foreign nationals visiting DOE Headquarters are subject to advance security screening procedures. Any foreign national wishing to participate in the meeting should advise DOE as soon as possible by contacting Ms. Brenda Edwards at (202) 586–2945 to initiate the necessary procedures.

Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at <http://www.regulations.gov>. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE-2011-BT-NOA-0067, by any of the following methods:

- *E-mail:* to [STB-RFI-2011-NOA-0067@ee.doe.gov](mailto:STB-RFI-2011-NOA-0067@ee.doe.gov). Include EERE-2011-BT-NOA-0067 in the subject line of the message.
- *Mail:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, Mailstop EE–2J, Request for Information for Set-top boxes and Network Equipment,

EERE-2011-BT-NOA-0067, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Phone: (202) 586–2945. Please submit one signed paper original.

- *Hand Delivery/Courier:* Ms. Brenda Edwards, U.S. Department of Energy, Building Technologies Program, 6th Floor, 950 L’Enfant Plaza, SW., Washington, DC 20024. Phone: (202) 586–2945. Please submit one signed paper original.

*Instructions:* All submissions received must include the agency name and docket number or RIN for this rulemaking.

*Docket:* For access to the docket to read background documents, or comments received, go to the Federal eRulemaking Portal at <http://www.regulations.gov>.

**FOR FURTHER INFORMATION CONTACT:**

Direct requests for additional information may be sent to:

Mr. Jeremy Domm, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, EE–2J, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: (202)586–9870. E-mail:

[Jeremy.Domm@ee.doe.gov](mailto:Jeremy.Domm@ee.doe.gov).

In the office of the General Counsel, contact Ms. Celia Sher, U.S. Department of Energy, Office of the General Counsel, GC–71, 1000 Independence Avenue, SW., Washington, DC 20585–0121. Telephone: (202) 287–6122. E-mail: [Celia.Sher@hq.doe.gov](mailto:Celia.Sher@hq.doe.gov).

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### I. Introduction

Title III of the Energy Policy and Conservation Act (EPCA), as amended (42 U.S.C. 6291 *et seq.*), sets forth various provisions designed to improve energy efficiency. Part A of Title III of EPCA (42 U.S.C. 6291–6309) established the Energy Conservation Program for Consumer Products Other Than Automobiles,” which covers consumer products and certain commercial products (referred to as “covered products”).<sup>1</sup> In addition to specifying a list of covered residential and commercial products, EPCA contains provisions that enable the Secretary of Energy to classify additional types of consumer products as covered products.

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<sup>1</sup> For editorial reasons, upon codification in the U.S. Code, Part B was re-designated Part A.

DOE recently published a Notice of Proposed Determination (76 FR 34914, June 15, 2011) (hereafter referred to as “proposed determination”) that preliminarily determined that STBs and network equipment meet the criteria for covered products because classifying products of such type as covered products is necessary or appropriate to carry out the purposes of EPCA, and the average U.S. household energy use for STBs and network equipment is likely to exceed 100 kilowatt-hours (kWh) per year.

DOE may prescribe test procedures for any product it classifies as a “covered product.” (42 U.S.C. 6293(b)) Further, DOE may consider prescribing energy conservation standards for a type of consumer product it classifies as covered if the product meets certain additional criteria, such as “average per household energy use within the United States” in excess of 150 kWh and “aggregate household energy use” in excess of 4.2 billion kWh, for any prior 12-month period. (42 U.S.C. 6295(l)(1))

DOE is initiating the rulemaking and data collection process for a test procedure and potential establishment of an energy conservation standard for STBs and network equipment with publication of this RFI. This process will analyze the technological, environmental, employment, and regulatory impact of a test procedure and standard on consumers, manufacturers, utilities, and the nation. During this analysis, DOE will determine the feasibility of establishing a standard that achieves the maximum improvement in energy efficiency that is technologically feasible and economically justified. To support this analysis, DOE will develop a test procedure to measure the energy efficiency of STBs and network equipment that reflects consumer use, ensures repeatability of results and is not unduly burdensome to conduct. DOE is asking interested parties for additional information that will assist DOE in performing its

analysis and in developing a test procedure and energy conservation standard for STBs and network equipment.

For reference, DOE has published a Market and Technology Assessment on the DOE Set-Top Box and Network Equipment Appliance Standards website, located at [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/set\\_top\\_boxes.html](http://www1.eere.energy.gov/buildings/appliance_standards/residential/set_top_boxes.html), that includes the data currently gathered on STBs.

Note that any comments already provided in response to the proposed determination do not need to be resubmitted. DOE will formally respond to comments already submitted in a final determination for coverage of STBs and network equipment that will be issued at a later stage in the rulemaking process.

## **II. Discussion**

DOE will review existing industry test procedures and standards to develop its own test procedure and efficiency standard for STBs and network equipment. Current industry test procedures and standards for STBs include the Environmental Protection Agency's (EPA) ENERGY STAR<sup>®</sup> Program Requirements for Set-top Boxes Version 3.0<sup>2</sup>, Canadian Standards Association's (CSA) test procedure C380-08<sup>3</sup>, and Consumer Electronics Association's (CEA) industry standards CEA-2013<sup>4</sup> and CEA-2022<sup>5</sup>. Additionally, DOE will evaluate the International Electrotechnical Commission's (IEC) industry standard IEC-62087<sup>6</sup>, which includes STBs in its scope. Notably, the ENERGY STAR program defines its own test method

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<sup>2</sup> ENERGY STAR Program Requirements Product Specification for Set-top Boxes: Test Method Rev. Jan-2011 (2011).

<sup>3</sup> C380-08: Test Procedure for the Measurement of Energy Consumption of Set-Top Boxes (2008).

<sup>4</sup> CEA-2013-A: Digital STB Background Power Consumption (2007).

<sup>5</sup> CEA-2022: Digital STB Active Power Consumption Measurement (2007).

<sup>6</sup> IEC-62087: Methods of measurement for the power consumption of audio, video and related equipment. Edition 3 (2011) Section 8.

for STBs, but does reference the CSA test procedure for test setup and instrumentation. The CEA standards are similar to CSA's test procedure, but they cover fewer functional features as compared to the ENERGY STAR method. These test procedures and industry standards were used as a basis for identifying the below issues for which DOE is specifically seeking feedback.<sup>7</sup>

## **A. Energy Conservation Standard**

### **1. Product Classes**

When necessary, DOE divides covered products into classes by the type of energy used, the capacity of the product, and any other performance-related feature that justifies different standard levels, such as features affecting consumer utility. (42 U.S.C. 6295(q)) As part of this rulemaking proceeding, DOE will evaluate the market for STBs and potentially separate them into product classes based on the criteria outlined above.

The current ENERGY STAR program separates STBs into different base functionalities: Cable, Satellite, Cable Digital Transport Adapter (DTA), Internet Protocol (IP), Terrestrial, and Thin Client/Remote<sup>8</sup>. Each base functionality type has a different energy consumption allowance (i.e., a different efficiency level) for qualification with the ENERGY STAR specification. Differentiating products by functionalities recognizes the fact that different underlying technologies such as Cable and Satellite STBs may require more energy than Thin Clients or Cable DTA STBs. ENERGY STAR also provides for higher energy consumption allowances based on various additional features (e.g. Digital Video Recorder, High Definition Resolution).

As part of DOE's investigation of potential product classes for STBs and network equipment, DOE is considering investigating the definitions of STB base functionality types and

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<sup>7</sup> DOE will also consider the National Cable & Telecommunications Association's "CableLabs – Energy Lab" initiative, which was announced on November 18, 2011 but is as yet preliminary.

<sup>8</sup> ENERGY STAR Program Requirements: Product Specification for Set-top Boxes Eligibility Criteria Version 3.0 (2011) Table 3.

the additional features currently employed by the ENERGY STAR program<sup>9</sup>. In particular, DOE is considering defining a separate product class for each combination of functionality type and an additional feature or features. However, in order to make this determination, DOE will have to analyze whether each combination of functionality type and additional features meets DOE's criteria for establishing product classes. Further details concerning the base functionality types and additional features used by the ENERGY STAR program are discussed below.

### **Functionality Type**

- **Cable:** A STB whose primary function is to receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system with conditional access and deliver them to a consumer display, thin-client/remote STB, and/or recording device.
- **Satellite:** A STB whose primary function is to receive television signals from satellites and deliver them to a consumer display, thin-client/remote STB, and/or recording device.
- **Cable Digital Transport Adapter (Cable DTA):** A minimally-configured STB whose primary function is to receive television signals from a broadband, hybrid fiber/coaxial, or community cable distribution system and deliver them to a consumer display and/or recording device.
- **Internet Protocol Television (IPTV):** A STB whose primary function is to receive television/video signals encapsulated in Internet Protocol packets and deliver them to a consumer display, thin-client/remote STB, and/or recording device.
- **Terrestrial:** A STB whose primary function is to receive television signals over the air or via community cable distribution system without conditional access and deliver them to a consumer display, thin-client/remote STB, and/or recording device.

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<sup>9</sup> ENERGY STAR Program Requirements: Product Specification for Set-top Boxes Eligibility Criteria Version 3.0 (2011) Sections 1.A and 1.B.2.

- **Thin-client / Remote:** A STB that (1) is designed to interface between a multi-room STB and a TV (or other output device), (2) has no ability to directly interface with a Service Provider, and (3) relies solely on a multi-room STB for content. Any STB that meets the definition of a cable, satellite, IP, or terrestrial STB is not a thin-client/remote STB.

### **Additional Features**

- **Advanced Video Processing (AVP):** The capability to encode, decode, and/or transcode audio/video signals in accordance with standards H.264/MPEG 4 or SMPTE 421M.
- **CableCARD:** The capability to decrypt premium audio/video content and services and provide other network control functions via a plug-in conditional access module that complies with the ANSI/SCTE 28 2007 HOST-POD Interface Standard<sup>10</sup>.
- **Digital Video Recorder (DVR):** The capability to store video in a digital format to a rewritable disk drive or other non-volatile storage device integrated into a STB. This definition excludes video capture software for personal computers or server-based DVR capabilities.
- **DOCSIS:** The capability to distribute data and audio/video content over cable television infrastructure in accordance with the CableLabs® Data Over Cable Service Interface Specification.
- **High Definition (HD) Resolution:** The capability to transmit or display video signals with resolution greater than or equal to 720p.
- **Standard Definition (SD) Resolution:** The capability to only transmit or display video signals with resolution less than 720p.

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<sup>10</sup> ANSI/SCTE 28 2007 HOST-POD Interface Standard (2007) [http://www.scte.org/standards/Standards\\_Home.aspx](http://www.scte.org/standards/Standards_Home.aspx)

- **Home Network Interface (HNI):** The capability to interface with external devices over a high bandwidth network (e.g., IEEE 802.11 (WiFi), MoCA, HPNA). For purposes of this specification, IEEE 802.3 wired Ethernet is not considered a Home Network Interface.
- **Multi-room (MR):** The capability to provide independent audio/video content to multiple devices within a single family dwelling. This definition does not include the capability to manage gateway services for multi-subscriber scenarios.
- **Multi-stream (MS):** The capability to deliver two or more simultaneous audio/video streams to a consumer display, thin-client/remote STB, or recording device. The simultaneous streams may be delivered via a physically separate input or via the primary input. This definition does not include out-of-band tuners.
- **Removable Media Player:** The capability to decode digitized audio/video signals on DVD or Blu-ray Disc optical media.
- **Removable Media Player / Recorder:** The capability to decode and record digitized audio/video signals on DVD or Blu-ray Disc optical media.

DOE welcomes feedback on consideration of the ENERGY STAR<sup>®</sup> program's identification of base functionality types and additional features in DOE's analysis of product classes for STBs and network equipment. DOE is also seeking feedback on potential methods to combine or reduce the number of product classes, the impact on energy consumption as a result of each of the functionality types and/or features, and market share data on the prevalence of these functionality types and/or features in STBs. Additionally, DOE seeks feedback from interested parties on the following questions:

- Should Cable DTA be a factor in defining a product class? DOE believes this is used for older analog televisions (TVs), which are becoming less common as consumers switch to digital TVs.
- How should tuner types be categorized? Are there significant energy differences between analog and digital tuners?
- Should streaming STBs (e.g., streaming video from a web-based service) be distinguished from service provider IPTV STBs? What, if any, differences are there between those types of STBs? Is the term “video signals” sufficient for including streaming STBs in the potential IPTV product classes?
- Should there be additional features defined due to significant differences in functionality (i.e., performance related feature) that affect energy consumption? Note that for ENERGY STAR, Cable DTA and Cable are two separate definitions despite the fact that they both use cable as the transmission medium.
- Is the Cable STB definition sufficient to include stand-alone DVRs (which include a CableCARD slot to interface with an existing service provider) generally purchased through retail? Should a separate product class exist for stand-alone DVRs?
- Should the Cable STB definition include CableCARD and DOCSIS functionality? Does CableCARD functionality consume energy when a CableCARD is installed but not used, or does it also have to be in use? DOE believes this feature only applies if it is actively decrypting video content during testing.
- Should the Advanced Video Processing feature encompass both encoding and decoding of video content? Would encoding or transcoding require more hardware and energy

consumption compared to decoding? Does the presence of Advanced Video Processing significantly affect power consumption when viewing MPEG-2 or analog video?

- Can Advanced Video Processing and High Definition be combined into a single functionality?
- Is it sufficient to define HD as any resolution greater than 720p? Should there be a separate definition for even higher video resolutions?
- Does the capability for multi-room increase the energy consumption of the STB when only one output is connected?
- Does the capability for multi-stream increase the energy consumption of the STB when only one stream is being accessed?
- None of the currently qualified ENERGY STAR products take credit for Removable Media Player or Recording. Are there STBs that currently implement removable media support? Does the presence of this feature increase the energy consumption when not in use (e.g. when the STB is accessing live TV content)?
- DOE further requests that interested parties comment on whether there are any features that would impact some potential product classes of STBs and network equipment differently than others? For example, would DVR functionality tend to increase the energy consumption of satellite STBs and cable STBs similarly?
- Lastly, should DOE consider any other additional features that currently exist or are in development that would significantly affect consumer behavior and/or STB energy consumption (e.g., 3D video processing, ultra high definition)?

## **2. Lower Power Sleep Mode**

One potential energy savings feature of STBs is entering a lower power sleep mode when not performing a primary function (such as watching or recording a television program).

Currently, many STBs consume nearly the same amount of energy regardless of whether the devices are performing a primary function. DOE realizes that service providers regularly communicate with deployed devices to maintain network and content security, and to ensure that program guides or on-demand offerings are updated. DOE also understands that some consumers may be opposed to long wake-up times when powering on their devices. Given the amount of potential energy savings, however, DOE is interested in methodologies that reduce energy consumption when the device is not in use while ensuring communication and wake-up times are minimally affected. DOE seeks feedback from interested parties on methodologies that reduce STB energy consumption when not performing a primary function. As an example, a STB could enter a deep sleep mode during off-peak hours (such as the middle of the night) and automatically wake up once every 30 minutes to communicate with the service provider and check for updates. At other times, the device would remain in a light sleep mode when not in use and not require a long wake-up time.

DOE seeks comments, data, and other input into technological, economic, and competitive impacts of using lower power light sleep and deep sleep modes for STBs. DOE also seeks feedback on any other issues related to lower power sleep modes. DOE is particularly interested in technological features that could significantly reduce energy consumption while providing for adequate communication with service providers and minimizing wake-up times when consumers power on their devices.

DOE is also interested in other examples and data of energy-reducing technologies, configurations or product designs, other than sleep modes, that could help improve the efficiency of STBs (e.g., spinning down hard disks, multi-room deployments).

### **3. Multi-room Setups**

DOE is aware that some service providers offer the use of multi-room setups where a single STB (usually with DVR functionality) is connected to the service provider, and that primary device then feeds video signals to thin-clients in the home through a network connection. This has the ability to save on total household energy consumption by using more efficient thin-clients instead of multiple devices.

In order for DOE to better understand these setups, DOE is seeking more information from interested parties on this topic. In particular:

- DOE is seeking market data on how prevalent multiple STBs are in current homes. For example, how many homes use two STBs? How many homes use three STBs?
- How much more power does a multi-room STB use compared to a thin-client device?
- How much more power does a multi-room STB use compared to a STB without multi-room capability?
- Are generic thin-client STBs capable of connecting to any multi-room STB, or will only specific models of thin-clients work with a given multi-room STB?

### **4. Typical User Profile**

In the development of potential energy conservation standards, it may become necessary to adopt standardized user profiles that estimate the average amount of time each day that STBs

are in each of their functional modes (e.g. active, standby, and off). It may also become necessary to develop estimates of the amount of time STBs with DVR functionality are in record or playback modes. This usage profile could then be applied to measurements obtained from a test procedure to estimate the typical daily or annual energy consumption of STBs. The ENERGY STAR program uses this methodology in their program<sup>11</sup>. DOE seeks feedback on whether it should adopt the ENERGY STAR usage profile or if an alternative methodology should be used when considering the metric for potential energy conservation standards, such as wattage requirements for each mode. A time-based metric, similar to the method used in ENERGY STAR, may be reasonable as many of the potential energy savings occur based on the time in each mode, and different product classes may have different opportunities for energy savings that could also help a product meet a standard.

## **5. Engineering Analysis**

As part of analyzing potential energy conservation standards for STBs and network equipment, DOE will develop an engineering analysis, which will characterize the incremental manufacturing cost associated with increasing the efficiency of STBs. As part of this analysis, DOE plans to gather data regarding the efficiency of STBs, run tests on STBs, and perform physical teardowns of STBs. DOE recognizes that there a variety of functionalities, features, and subscription services that may impact the efficiency of STBs. Therefore, DOE is strongly interested in collecting information from a wide variety of sources on the energy use of different types and configurations of STBs. As part of this analysis, DOE may be required to gain access to a subscription or head-end equipment similar to that of a consumer's access in order to test the

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<sup>11</sup> ENERGY STAR Program Requirements: Product Specification for Set-top Boxes Eligibility Criteria Version 3.0 (2011) Section 3.3.

STB. DOE is hopeful to gain access to features such as electronic-program-guides, video-on-demand, and pay-per-view for testing.

DOE understands that the nature of subscriptions and leasing agreements make it difficult for DOE to obtain equipment on the commercial market directly for purchase. Consequently, DOE will be reaching out to service providers and STB makers directly to inquire about obtaining the STBs for this analysis and any special equipment necessary for testing.

## **6. Market Data**

DOE seeks additional data on STB markets and technologies, including updated National energy use data<sup>12</sup> on STBs by potential product class. These data include numbers of installed devices, unit energy consumption, efficiency ranges, and usage profiles. Projected energy use data include historical and projected annual shipments of STBs, projected unit energy consumption for future models of STBs, and projected usage profiles based on new studies on consumer behavior.

### **B. Test Procedure**

The following discussion topics on testing primarily reference the ENERGY STAR program, but all of the previously referenced industry test procedures were used to help identify the following questions.

#### **1. Impact of Service Provider Software**

Service providers typically install software onto STBs rented to consumers. These STBs are programmed to have security features and constant communication with the service provider and allow customers to access specific content, such as video-on-demand or electronic program

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<sup>12</sup> Set-Top Box Market and Technology Assessment Report, Section 3.1.5, December 2011

guides. Based on initial testing, DOE believes the service provider software can have an impact on the energy consumption of a STB. Thus, DOE is considering that STBs be tested with the appropriate software added. In the event that the same physical STB can be programmed by different service providers, each service provider configuration would be treated as a different device (i.e., a different basic model). DOE would therefore test STBs as deployed in consumers' homes, rather than as shipped by the STB original equipment manufacturers to the service providers. In order to gain a better understanding of the issue, DOE requests feedback on the following:

- What impact does the service provider software have on energy consumption?
- How does service provider software impact idle or sleep behavior?
- How does such software affect any other energy saving features?
- For cable STBs, will there be different energy consumption of a generic STB with CableCARD accessing the digital programming of a service provider versus a programmed device with full two-way communication with the service provider?

## **2. Live Network Testing**

ENERGY STAR program specifications do not specify how the video source signal is to be delivered, and implicitly allow STBs to be tested either through a live network (via subscription service) or with a closed network. A closed network includes testing with head-end equipment provided by the service provider and/or manufacturer. Additionally, the CEA test procedures explicitly state that it is not expected that the STB would be connected to a live network<sup>13</sup>.

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<sup>13</sup> CEA-2022: Digital STB Active Power Consumption Measurement (2007) Section 6.4.d.

Subscription services (i.e., one type of live network) are more typical of how a consumer would be using the STB. Using a subscription would be simpler to setup for testing, and it would require little involvement by the service provider other than providing the subscription itself. However, DOE has concerns that subscriptions would not be available in all test areas, thus some labs would be physically incapable of testing certain STBs. Additionally, STB behavior may be impacted by geographic location, weather (for satellite connection), and time of day. Subscriptions themselves can vary depending on the type chosen for testing as service providers generally have different package choices that could be accessed by the same STB hardware. Finally, video format may not be as controllable through a subscription, which may be required for testing (see Section II.B.3. of this document).

Closed network testing can solve some of the repeatability issues for testing. However, it requires proprietary hardware and software from the service provider. This equipment can be large and costly to use, and may be very difficult to setup and configure. DOE also has concerns that the programmed head-end equipment and physical setup may not be realistic due to the lack of access to certain features, which may impact energy consumption of the STB.

Because of the potential difficulties in using a closed network, DOE is considering that STBs be tested via subscription service only. DOE is also considering allowing closed network testing and may need to specify head-end requirements in this case. DOE would like feedback from interested parties on these two methods. Specifically,

- How will STB behavior compare between closed network testing and live network testing?
- How will STBs with subscription service be affected by geographic location and time of day?

- How will energy usage of the STB be affected by the subscription package selected?
- Are there any obstacles with service providers providing head-end equipment to labs for testing STBs?
- Are there any additional factors that should be considered when deciding between closed network and live network testing methods?
- Are there other potential test setups that should be considered?

### **3. Video Source**

The ENERGY STAR test procedure describes three reference channels to be used for testing STBs. They are as follows<sup>14</sup>:

- 1) Reference Channel A: Network television channel, standard definition (SD) format, minimum 480i resolution.
- 2) Reference Channel B: Live or recorded sports channel;
  - a. If the STB is HD-capable, this channel shall be in HD format, minimum 720p resolution.
  - b. If the STB is not HD-capable, this channel shall be in SD format, minimum 480i resolution.
- 3) Reference Channel C: 24-hour news channel, standard definition (SD) format, minimum 480i resolution.

DOE has initial concerns with the ENERGY STAR test procedure's lack of a video signal standard for repeatability, as the video source may impact the STB energy consumption. However, a subscription based testing would not necessarily have control of the video content.

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<sup>14</sup> ENERGY STAR Program Requirements: Test Method Rev. Jan-2011 (2011) Section 4.H.

Due to differences in video processing, DOE is also concerned that the chosen video format will have an impact on energy consumption of the STB, and that a minimum video resolution would not be sufficient to guarantee a repeatable test. For high definition format, one lab may test at 720p, and another lab may use 1080p, which could result in different recorded energy consumptions. Additionally, some STBs may be preconfigured to output a set video resolution. Thus, any video input source that differed from the output resolution would require additional video processing. For example, using a 720p input signal may require more energy when converting to 1080i compared to a native 1080i input signal.

DOE is also concerned that there are additional parameters that may need to be specified if using a controlled test signal. Frame rate may also need to be specified as there could potentially be differences between 60 frames per second video sources versus 24 frames per second. Video bit rates may also need to be specified as lower bitrates would likely require less energy at the expense of lower quality video. Finally, the video codec should be specified for repeatability. MPEG-4 decoding may require additional hardware compared to MPEG-2.

Because different service providers may provide different video formats to their customers, DOE is considering an alternative method where the tester can randomly choose a video source. The chosen channel and video specifications would need to be reported or measured, and energy consumption would be normalized to make different video formats comparable. For example, it is expected that a STB decoding video at 5 megabits per second would use less energy than a STB decoding video at 10 megabits per second. DOE would attempt to normalize out the bitrate aspect of energy consumption in setting standard levels. DOE is aware that this method may not be as repeatable as creating a specific test signal, but it

will ensure some level of control for video content and source while still simulating the consumer experience.

DOE is also considering specifying minimum requirements for video content for testing and/or using a standard test video source if it is technically feasible. DOE seeks feedback from interested parties on this subject. In particular:

- How much modification do service providers make to content providers' signals? Does a specific channel use similar frame rates, encoding, and bit rates across different service providers or locations? DOE does not wish for service providers to lower the quality of video in order to meet potential energy standards.
- For a given service provider, are there any regional differences in video format? For example, would an HD broadcast of a specific channel be delivered at an identical video format across all geographic locations?
- How much variance in energy consumption would be expected based on the video content? Would sports content (more dynamic) have significant differences in energy consumption compared to news content (more static)?
- Is it possible to determine or measure the frame rate, bit rate, and video format being received by the STB? If so, how is this done?
- If labs are able to test with a controlled video source, what parameters most impact energy consumption? DOE has identified resolution, format, frame rate, and bit rate. Are these sufficient, or are there other parameters that should be specified? Are any of these parameters irrelevant to energy consumption?

#### **4. Digital Video Recorder Testing**

The ENERGY STAR test procedure includes testing DVR functionality<sup>15</sup>. The DVR alters STB behavior and consumer behavior by allowing the consumer to record content, watch offline content, and pause/rewind/fast-forward live broadcasts. This behavior is significantly different from a standard STB (also known as a receiver), which is primarily used to watch live video. The ENERGY STAR test procedure specifies that live TV testing includes pausing (5% of test time), fast forward (10% of test time), and rewind (10% of test time), and watching video for the remaining 75% of the time. It also specifies energy consumption for recording and playing back stored video.

DOE believes that energy consumption may depend on the order that these operations are performed as well as the number of transitions between modes. Additionally, DVR STBs usually have multiple speeds for fast forwarding and rewinding that may impact energy usage.

DOE is considering that each DVR operation mode be measured in a separate test for fixed test time durations. For example, the tester could measure power for 5 minutes while rewinding video, measure power for 5 minutes while playing video, and measure power for 5 minutes while fast-forwarding video. The weighting for energy consumption can be incorporated into the final efficiency metric. DOE is also considering including multiple speeds for fast-forward and rewind for testing. DOE seeks feedback from interested parties on handling DVR testing.

#### **5. Low Noise Block Power Consumption**

A low noise block (LNB) is used in conjunction with a satellite STB to improve signal reception. It can have a separate power supply, but some LNBs draw power from the STB

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<sup>15</sup> ENERGY STAR Program Requirements: Test Method Rev. Jan-2011 (2011) Sections 7.2, 7.3.

coaxial connection. The ENERGY STAR test procedure explicitly excludes the energy consumption of the LNB<sup>16</sup>, as does the CEA test procedure<sup>17</sup>.

DOE is considering including LNB energy consumption for satellite STBs, as the LNB is providing required functionality, and would like to identify what factors impact LNB energy consumption and whether these factors can be controlled in a lab scenario. Accordingly, DOE seeks feedback from interested parties on this topic or any of the following questions:

- How much power does the LNB consume compared to the STB?
- Does LNB energy consumption vary significantly based on the received signal or noise?
- Is it possible to test the STB with the LNB disabled or disconnected?
- Are there any known methods for accurately measuring the LNB power to exclude it from the STB energy consumption?
- What other factors influence the energy consumption of LNBs?
- Can all satellite STBs use an independently powered LNB as a means to separate LNB power from the STB?

### **III. Public Participation**

#### **A. Attendance at Public Meeting**

The time, date, and location of the public meeting are listed in the **DATES** and **ADDRESSES** sections at the beginning of this RFI. To attend the public meeting, please notify Ms. Brenda Edwards at (202) 586–2945. As explained in the **ADDRESSES** section, foreign nationals visiting DOE Headquarters are subject to advance security screening procedures.

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<sup>16</sup> ENERGY STAR Program Requirements: Test Method Rev. Jan-2011 (2011) Section 5.D.

<sup>17</sup> CEA-2022: Digital STB Active Power Consumption Measurement (2007) Section 6.1.2.a.

## **B. Procedure for Submitting Requests to Speak**

Any person who has an interest in the topics addressed in this RFI, or who is a representative of a group or class of persons that has an interest in these issues, may request an opportunity to make an oral presentation at the public meeting. Requests should be emailed to Ms. Brenda Edwards at [Brenda.Edwards@ee.doe.gov](mailto:Brenda.Edwards@ee.doe.gov). Persons who wish to speak should include their contact information and an attached file that describes the nature of their interest in this RFI and the topics they wish to discuss. DOE requests persons selected to make an oral presentation to submit an advance copy of their statements by January 19, 2011. DOE may permit persons who cannot supply an advance copy of their statement to participate, if those persons have made advance alternative arrangements with the Building Technologies Program. As necessary, requests to give an oral presentation should ask for such alternative arrangements.

## **C. Conduct of the Public Meeting**

DOE will designate a DOE official to preside at the public meeting and may also use a professional facilitator to aid discussion. The meeting will not be a judicial or evidentiary-type public hearing, but DOE will conduct it in accordance with section 336 of EPCA (42 U.S.C. 6306). There shall not be discussion of proprietary information, costs or prices, market share, or other commercial matters regulated by U.S. anti-trust laws. A court reporter will be present to record the proceedings and prepare a transcript. The public meeting will be conducted in an informal, conference style. DOE reserves the right to schedule the order of presentations and to establish the procedures governing the conduct of the public meeting. DOE will present summaries of comments received before the public meeting, allow time for presentations by participants, and encourage all interested parties to share their views on issues affecting this RFI.

Each participant will be allowed to make a prepared general statement (within time limits determined by DOE), before the discussion of specific topics. DOE will permit other participants to comment briefly on any general statements.

At the end of all prepared statements on each specific topic, DOE will permit participants to clarify their statements briefly and comment on statements made by others. Participants should be prepared to answer DOE's and other participants' questions. DOE representatives may also ask participants about other matters relevant to this RFI. The official conducting the public meeting will accept additional comments or questions from those attending as time permits. The presiding official will announce any further procedural rules or modification of these procedures that may be needed for the proper conduct of the public meeting. After the public meeting, interested parties may submit further comments on the proceedings as well as on any aspect of the RFI until the end of the comment period. DOE will make the entire record of this proceeding, including the transcript from the public meeting, available on the DOE website.

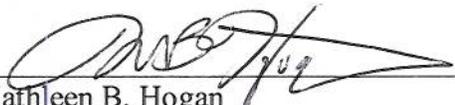
#### **D. Submission of Comments**

DOE welcomes comments on all aspects of this RFI and on other relevant issues that participants believe would affect test procedures and energy conservation standards applicable to STBs and network equipment.

After the close of the comment period, DOE will begin collecting data, conducting the analyses, and reviewing the public comments. These actions will be taken to aid in the development of a test procedure notice of proposed rulemaking (NOPR) and energy conservation standard NOPR for STBs and network equipment.

DOE considers public participation to be a very important part of the process for developing test procedures and energy conservation standards. DOE actively encourages the participation and interaction of the public during the comment period in each stage of the rulemaking process. Interactions with and between members of the public provide a balanced discussion of the issues and assist DOE in the rulemaking process. Anyone who wishes to be added to the DOE mailing list to receive future notices and information about this rulemaking should contact Mr. Jeremy Dommus at (202) 586-9870, or via e-mail at [Jeremy.Dommus@ee.doe.gov](mailto:Jeremy.Dommus@ee.doe.gov).

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Energy Efficiency and Renewable Energy